

ABSTRACT

A pilot study was conducted on the premature failures of neoprene strip seals in expansion joints in Iowa bridges. In a relatively large number of bridges, strip seals have pulled out of the steel extrusions or otherwise failed well before the expected life span of the seal. The most serious consequence of a strip-seal failure is damage to the bridge substructure due to salt, water, and debris interacting with the substructure.

A literature review was performed. Manufacturers' specifications and recommendations, practices in the states bordering Iowa, and Iowa DOT design and installation guidelines were reviewed. Discussions were held with bridge contractors and the installation of a strip seal system was observed. Iowa DOT bridge databases were analyzed. A national survey was conducted on the use and performance of strip seals.

With guidance from the Iowa DOT, twelve in-service bridges with strip-seal expansion joints were selected for detailed investigation. Effective bridge temperatures and corresponding expansion-joint openings were measured, DOT inspection reports were reviewed, and likely cause(s) of premature failures of strip seals were proposed.

All of the seals used in the twelve bridges that had the most serious failures were in concrete girder bridges. Experimental results show that for a majority of these serious failures, the joint opening at 0° F predicted by the Iowa DOT design equations, the joint opening at 0° F extrapolated from the experimental data, or both, are larger than the movement rating of the strip seal specified on the bridge plans. Other likely causes of premature failures of seals in the twelve bridges include debris and ice in the seal cavity, a large skew and the corresponding decrease in the movement rating of the seal, improper installation, and improper setting of the initial gap.